Inventories for Mitigation Planning: The Berkeley Case

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Soft Story Assessment Project

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Information Needed Depends...

- ⌘ ...on the nature of the policy decision
  - ⌂ Detail and accuracy
- ⌘ ...the resources (skills and money) available
- ⌘ It's more than building type and address

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Policy Decisions Consider

- Social (use, and the number and nature of occupants, parking)
- Technical (size, date of design, construction materials, existing condition, vulnerability, location)
- Administrative (number of buildings, ownership)
- Political (community impacts, consequences of earthquake losses, cost and disruption of a retrofit program, possible incentives)
- Legal (notice contents, policy intervention)
- Economic (cost of expected losses and of retrofit, rental income)
- Environmental (historic or architectural)

Data Collection

- Often an iterative process that increases knowledge and accuracy
- Often overlapping materials, uses and locations
- Not just an engineering exercise, other information is crucial
  - STAPLEE

Berkeley Inventories

- ⌘ Unreinforced masonry buildings
- ⌘ City-owned buildings
- ⌘ Earthquake-vulnerable buildings
- ⌘ Multi unit, soft story residential buildings

Vulnerable Buildings Inventory

⌘ Done by Jim Russell and Marg Hall

⌃ Completed in 1996

⌃ Identified typically vulnerable buildings

⌃ Conducted quickly, a sidewalk survey

⌘ Results

⌃ A list of about 2000 URM, tilt-up and soft story buildings

⌃ Defined the scope of the problem

⌃ Specific buildings are only "suspects"

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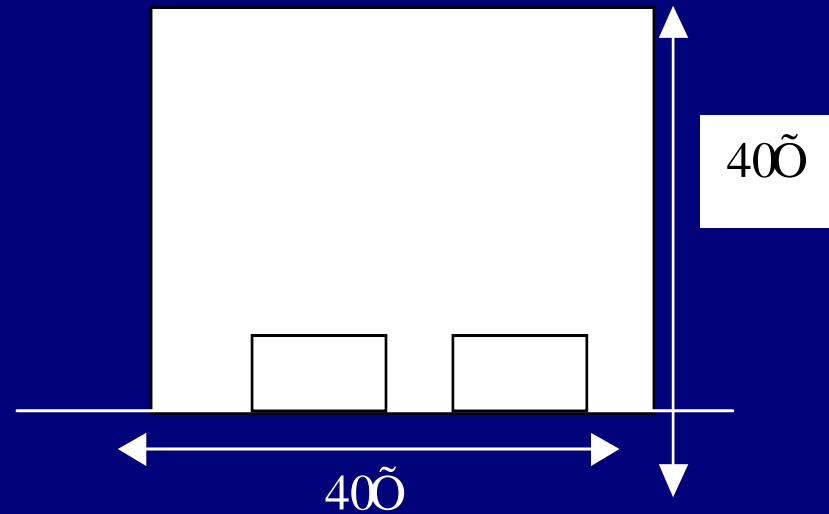are needed to see this picture.

Soft Story Residential Buildings

⌘ Built a database of information in Access

- ⌂ Recorded information on each building from permit files, assessor roles
- ⌂ Defined four model types for loss estimates
- ⌂ Selected a subset of buildings to observe
- ⌂ 400 soft story residential buildings
- ⌂ 4,750 residential units

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Prototype I

I. Four story apartment building (<15 units)

- All wood construction
- Resembles a large house
- Garage doors 1 or more sides
- 34 Walkabout properties
- 128 Total Prototype I buildings
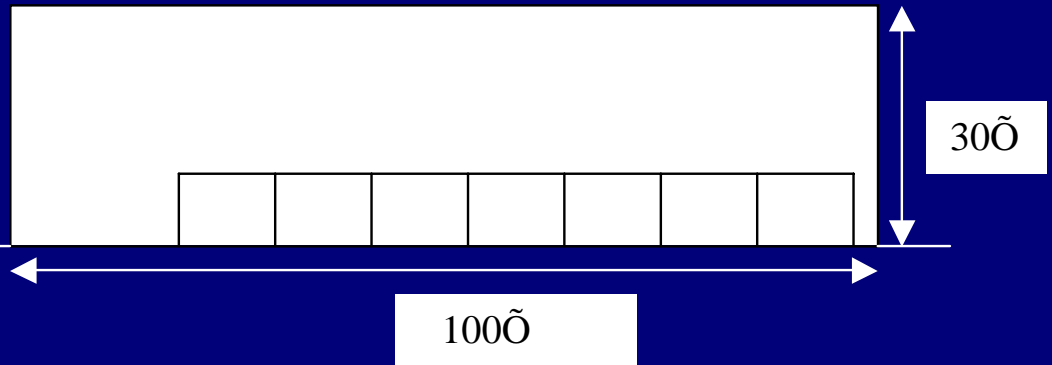- 1,228 Total Prototype I units

40̃

40̃

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Prototype II

II. Three story apartment building

- Tuck under parking
- Flexible diaphragm
- RM walls ground floor possible
- Steel pipe columns
- 53 Walkabout properties
- 192 Total Prototype II buildings
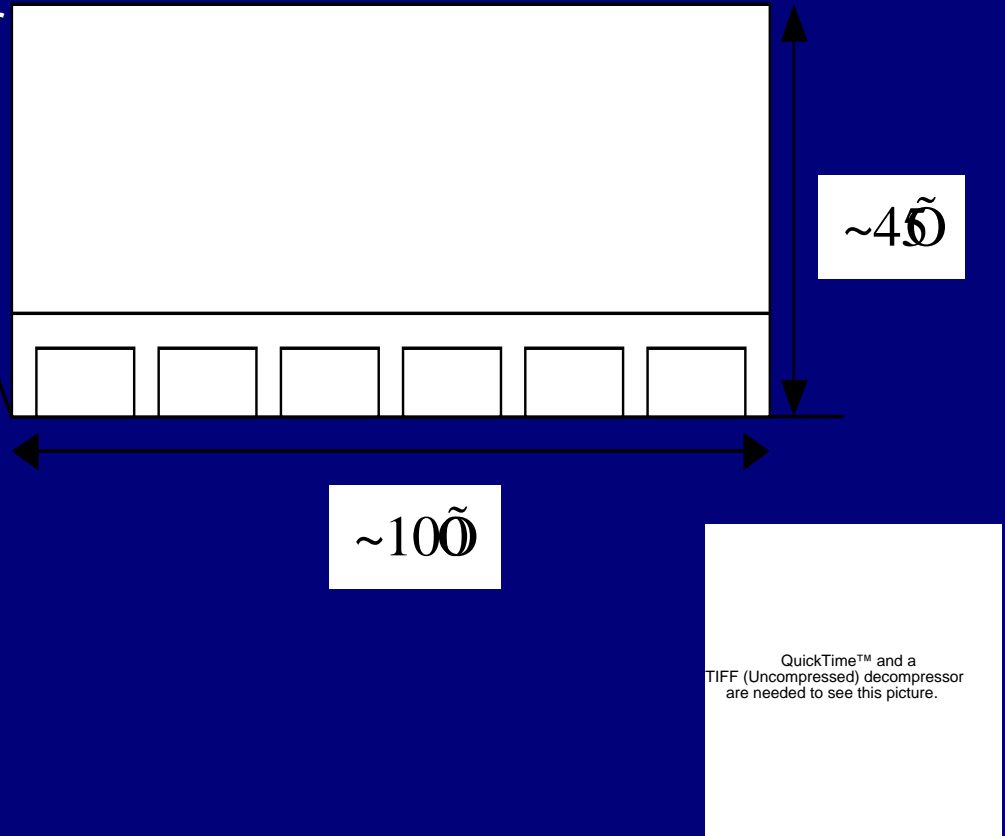- 2,122 Total Prototype II units

30Õ

100Õ

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Prototype III

**III. Four story building with ground floor concrete garage**

- Wood superstructure
- RM or concrete shear walls ground floor
- Rigid Diaphragm
- 20 to 40 units
- Irregular shaped
- 35 Walkabout properties
- 47 Total Prototype II buildings
- 957 Total Prototype II units

$\sim 45'$

$\sim 100'$

Prototype IV

IV. Mega-apartment building typically four or five stories

- Many Construction Types
- Rigid Diaphragm
- Irregular shaped
- Open courtyards
- 40 to 100 units
- 24 Walkabout properties
- 24 Total Prototype IV buildings
- 1,060 Total Protoype units

~50Õ

200Õ

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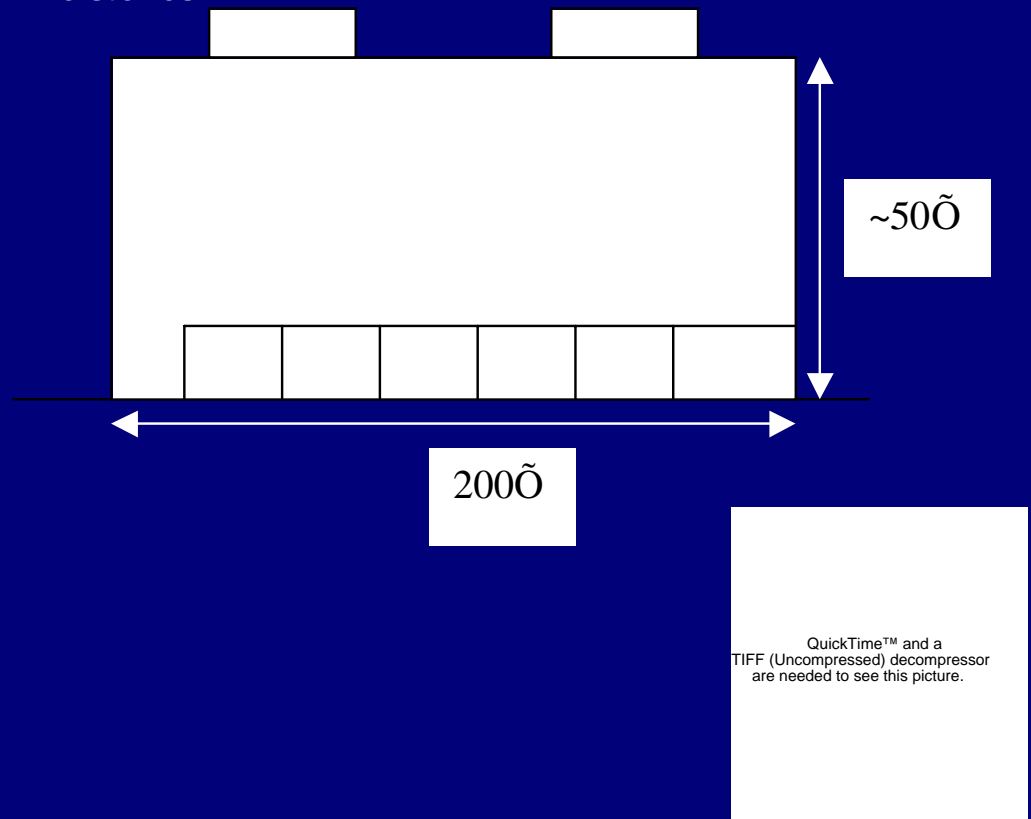
The Walkabout Preparation

- ⌘ Prepared a data collection form
- ⌘ Programmed Palm Pilots
- ⌘ Prepared itineraries for each team
- ⌘ Established files for each building Recruited Volunteers
  - ⬠ EERI NC Chapter—Structural Engineers
  - ⬠ Berkeley Student Chapter
- ⌘ Bought donuts
- ⌘ Briefed participants

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The Walkabout

⌘ Held on two Saturdays, fall 2001

⌘ Encouraged discussions and mentoring

⌘ Sidewalk observations of 146 buildings

◰ Assigned a prototype

◰ Percent of open ground floor area

◰ Confirmed information (configuration, materials)

⌘ Expressed judgment (vulnerability, parking, condition)

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After the Walkabout

⌘Entered data

⌘Summarized results

⌘Extrapolated to the 250 buildings not inspected

⌘Informed policy decisions

- Building priorities~67
- Timeline
- Assertiveness of the policy

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Results

- ⌘ Expect to red tag 46 percent of the buildings with over 4,750 units
  - ⌂ 17 percent have "severe" vulnerabilities
  - ⌂ 29 percent have "considerable" vulnerabilities
- ⌘ Expect to yellow tag 49 percent of the buildings
- ⌘ Ground floor units in 36 percent of the buildings
- ⌘ 89 percent need further attention
  - ⌂ 62 percent should be retrofitted
  - ⌂ 27 percent should be analyzed further
- ⌘ Parking space loss would be minimal

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Results (continued)

- Berkeley has a significant residential vulnerability threatening the availability and affordability of residences in multi unit buildings
- The assessment
  - Added credibility to the list of buildings, their vulnerability and consequences for the community
  - Provided information for decisions regarding a program to encourage or require mitigation
- The issue is on the policy agenda

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Shortcomings

- Quantifying vulnerability is approximate and judgments will vary
- Loss estimates are only estimates
- Benefit cost analysis not supported
- Use of Palm Pilots has potential, but really was not that useful

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Advice

⌘If you need the information, get started

⌘Don't be put off by the engineering judgment aspect

⌘Don't forget other information is just as important

⌘Do what you can with the resources at hand

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